GAS DISTRIBUTION IN SYRACUSE, N. Y.

BY

S. C. SINGER

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GAS DISTRIBUTION IN SYRACUSE, N. Y.

A THESIS
PRESENTED BY
SIDNEY CHARLES SINGER
TO THE
PRESIDENT AND FACULTY
OF
ARMOUR INSTITUTE OF TECHNOLOGY
FOR THE DEGREE
OF
MECHANICAL ENGINEER

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I906-7-8.

2- Practical Testing Of Gas And Gas Meters-Stone.

3- American Gas Light Journal.

22125

The proper distribution of gas for industrial and domestic purposes imposes, upon the engineer in charge, a threefold duty, namely, to attain and maintain efficient service, to secure economic operation, and finally to keep both well within the bounds of good sound practical engineering.

By efficient service is meant the prompt and proper attention to applications for new installations and quick response to complaints of the various kinds. Both of these cause a satisfied feeling to exist between the consumer and company. When this feeling exists then can the corporation engineer claim the fulfillment of one of his greatest charges. As Distribution Superintendent at Syracuse, N. Y., I believe that I can satisfy our thirty thousand (30,000) consumers, burning daily about two millions of cubic feet of gas with the following schedule of work and at the same time get economical operating costs.

NEW INSTALLATIONS

Nature of work	Time of completion after date of notification
I- Service installed	One week
2- Meter "	Three days

NEW INSTALLATIONS (Continued)

3- Range connection	Three days
4- Circulating Water Heater connection with vent pipe attached.	Six days
5- House Piping	Seven days
6- Automatic Heater connection	Six days
7- Industrial Appliance connection	Four days

COMPLAINTS

I- Leaks	Immediate
2- No gas or poor pressure	Same day
3- Removal of meters	Two days
4- Turn on or turn off supply	Orders received at shop by noon executed same, day others the next day.

Frequently our service is better than the schedule shows and we aim to live well within its limits. A copy of this schedule is kept at the Order Counter in the Main Office, so that the public may readily become acquainted with our methods and endeavors to serve them.

Our installation, repair and complaint work divides itself into eight classes each requiring close and constant attention. The following scheme

gives a fair idea of the general method of handling this work. During the year I909 we handled, through the department, about 62,265 orders excluding orders for main extensions. In one month alone, May, the total orders attended to amounted to 5,854.

At a glance the reader can see a logical well planned labor organization with each division as shown responsible and necessary to the other for the carrying out of any one or set of ideas.

Before I enter into the discussion of the economic side of gas distribution I shall dwell a little on the general layout and conditions effecting the entire distribution system in Syracuse.

Syracuse lies in a valley extending north and south has a few hills. Its elevations above sea level vary from 339.II feet (Gas Works Cor. Wallace and Mechanic Streets) to 573.60 feet (Cor. Euclid and Westcott Streets).

Our mains cover a distance of about 848,839 feet (I60.77) miles divided and laid as follows:-

SIZE			SIZE		
2"-	4,6I8	feet	8"-	48,660	feet
3"-	53,353	"	I0"-	22,350	"
4"-	474.I5I	"	I2"-	7,080	"
6"-	235,922	"	I6"-	2,I65	"

20"- 520 feet

To fill these mains alone requires I8,936,73I cubic feet of gas. The following table shows the cost of distributing this gas:-

DIST-COST PER -M- SEND OUT	
Consumers fixture and appliances	$0.002
Repairs to mains and services	0.0I0
Repairs to meters	0.0075
Resetting and removing meters	0.0025
Complaints	0.0050
Turn on Turn off gas supply	0.00I0
Salaries	0.I00
Total	$0.0372

With a daily output of about two millions cubic feet we are endeavoring to serve about thirty thousand consumers. Our pressures vary during the hour of peak load from twenty-five to thirty-five tenths inches of water. To maintain these pressures we carry thirty-eight tenths inches of water pressure at the works and the same at an outlying holder in the south central part of the city (Montgomery between Burt and Croton Streets). At present we have an eight inch high pressure Dresser clamped cast iron pipe line

laid to the north side (Cor. N. State and Kirkpatrick Streets). We will lay similar legs to the extreme south sections and west sections this year. By means of a "Booster" at the gas works and governors at the ends of the high pressure legs we can send sufficient gas at the proper pressure to all of the outlying districts, allowing the surplus to feed back toward the works into our low pressure system. This will relieve all congestion at peak load times, and will give excellent satisfaction to both company and consumer.

Every year during October we take simultaneous pressures throughout the city. These pressures are taken at a time of day showing peak load or times of maximum consumption. October is chosen because of the lapsing of fuel and light consumption. These pressures give us a line as to the amount of gas delivered at various points and thus of the capacity and up-to-dateness of our system. Before these pressures are taken extra precautions are taken to have the mains clear of condensation.

Returning to the organization of the distribution department:- The organization consists

of a distribution superintendent aided by five lieutenants who in turn are assisted by foremen and inspectors. It is fitting that a cadet engineer be employed for he should be in readiness to take up the duties of superintendent in case of accident, removal or promotion. In Syracuse he starts with the street main laying division and works through each division of labor until thouroughly familiar with all details therein contained in the street department. His duties consist chiefly of attention to maps and directing the work of the three main laying gangs. Sketches of all the underground work are made and each pipe joint is located as to depth and distance from nearest property line.

Each main gang consists of a foreman, two calkers, one main layer, water-boy and twenty-five laborers. The number of laborers to us in each gang varies from time to time depending on the length of line to be run. The accompanying curves shows the economic effect of using gangs of from twenty to forty laborers.

Our mains are laid at an average depth of three feet six inches (3'-6") below street grade

and about five (5) feet from the curb line. All ends of the pipe are cleaned with a wire brush before being entered. Portland cement and untarred jute packing constitutes the joining material. These are used in the following proportions per joint:-

Size of joints	Quarts of cement	Ozs. of yarn
4"	0.8	2
6"	I.2	4½
8"	I.3	5
I0"	2.3	I0
I2"	2.8	II
I6"	3.25	I3½
20"	4.45	I6

All mains are laid to grade so as to take care of the condensation from the cooled gas. At intervals, determined by the profile of the territory, pupming stations or drips are placed so as to catch the condensation and hold it until it is removed. Such stations located on the ends of mains are made by tapping a I" hole in the top of the main and inserting therein a long running thread with I/4" of inside of the bottom of the main. Ells and pipe are attached at this opening bringing the stand-pipe within the curb line. This kind of drip is used because of its temporary qualities. The hole drilled in the main can be used as an opening for a stopper

when the pipe is to be added to that already in the ground. The condensation is carried farther on in the new pipe and a new drip is made. If the drip station is located on a street where both extremities of the street are higher in elevation than the center, then a drip-pot is inserted as apart of the gas main and connections are run to the curb for pumping accessibility. An accompanying sketch and schedule shows this kind of drip. A "tell-tale" made of 3/4" pipe is set in the pot to a depth corresponding with the bottom of the inside of the main. When the pot fills so as to seal off gas from the inside of this 3/4" pipe an observer knows that the condensation is backing into the main causing a fluctuating pressure at the consumers burners.

Drips Pumped During Year 1909

January	726	July	804
February	575	August	831
March	839	September	835
April	838	October	868
May	813	November	802
June	823	December	781

Total 9,535

During the year 1909 the following drips were pumped at the indicated cost:

Total drips pumped	9,535
Total labor	$547.75
Total horse & wagon	624.00
Cost per drip-labor	0.0573
Cost per drip-horse & wagon	0.0654
Total cost per drip	$0.1227

Blocking 2" x 12" x 12" is embedded in the trenches in front and back of each bell and is placed at a depth level with the rest of the trench. Small wedges 3" x 3"x 6" are used to hold the pipe in position.

Neat cement used must be free from grit or other foreign subatance and must not be of a too rapid setting kind. Only enough for one joint is made up at a time and all joints have a protecting face or collar of cement.

Daily progress reports are kept on the main work and cost per foot figures are known at completion of each extension.

DAILY REPORT OF MAINS AND SERVICES

For 24 hours ending 6 P.M.---

Weather---------

MAINS

Size	4"	6"	8"	10"	12"	16"	20"
Laid this day							

DAILY REPORT OF MAINS AND SERVICES

(continued)

Size	4"	6"	8"	10"	12"	20"
Laid since Jan. Ist						
Auth. rec'd to-day						
Total to be laid						
Pipe on hand						

Foreman No of men Auth. Size

Street From To

Trench opened Back filled Pipe laid

Foreman No of men Auth. Size

Street From To

Trench opened Back filled Pipe laid

Foreman No of men Length

Location Size

With the main laid on any given street our interests turn to the service division of physical distribution.

Our service inspector reports direct to the superintendent. He is assisted by five pipe and one repair gangs, and is expected to direct their work, supplying orders and material for the giving of proper service connection upon application. Each of the five pipe gangs consist of a

foreman and three laborers. With this combination it is possible to-run one hundred and twenty (I20) feet of service pipe per gang per ten (I0) hour day.

The size of the service pipe to be run is determined by the superintendent; a standard schedule used is as follows:

SERVICE SCHEDULE

	Length not Exceeding I00 ft.	Length over I00 ft. and not exceeding I50 ft.
	Size Of Service	Size Of Service
Dwellings of 6 Rooms or under	I"	I¼"
Dwellings 7 to I2 Rooms	I¼"	I½"
Dwellings I3 to 20 Rooms	I½"	2"
Dwellings over 20 Rooms	I½"	2"
Stores and other dwellings with not more than I5 outlets	I¼"	I½"
Stores and other buildings with from I6 to 30 outlets	I½"	2"

The first column shows the proper size of service for distances not exceeding I00 feet from the main to the meter, and the second column shows the size of service to run for a distances exceeding

I00 feet, but not exceeding I50 feet.

For distances exceeding I50 feet, and for factories or other buildings with more than 30 outlets, use the Cox Cumputer in determining the proper size, and make the size such that for the given distance and for the estimated maximum consumption per hour, the loss in pressure will not exceed 2 tenths.

On paved streets a trench eighteen (I8) inches wide is used, while on unpaved streets it is not economical to use less than twenty-two (22) inches. The main to be tapped is bared and a Mueller standard #I4 tapping machine is chained to it in a vertical position. A screw tap is made according to the following schedule:-

SCHEDULE FOR TAPPING MAINS FOR SERVICE RUNS

Size of				Cast	Iron				
Main	2"	3"	4"	6"	8"	I0"	I2"	I6"	20"
Size of Service	Tap in Main		=	=	=	=	=	=	=
I"	1" split sleeve	¾"	I"	I"	I"	I"	I"	I"	I"
I¼"	1¼" " "	¾"	I"	I¼"	I¼"	I¼"	I¼"	I¼"	I½"
I½"	1½" " "	=	I"	I½"	I½"	I½"	I½"	I½"	I½"
2"		Tee	=	I½"	I½"	2"	2"	2"	2"
2½"		2" split sleeve	=	=	2"	2"	2"	2"	2"
3"		Tee	Tee	Tee	2½" split sleeve	=	2½"	2½"	2½"

When the machine is removed a street-tee is screwed into the main. Into the top of the tee is inserted a rubber stopper which when pushed down shuts off gas from the center outlet of the tee. Into the center outlet of the tee is screwed a street-ell. This combination of fittings allows a universal swing and takes care of any strain in either horizontal or vertical planes.

All screw joints are made with a mixture of cement and boiled linseed oil. All wrought iron pipe and fittings are painted before used with a coating made of slack lime, tar, tallow, resin and rubber. This coating should be applied while hot. The pipe and fittings are laid so as to pitch toward the main from which it is tapped. Services should be laid so as to avoid the use of ells or tees, should have at least two feet of cover at the entrance to a dwelling, and should be run at right angles to the existing main. On the service at the inside of the cellar wall, should be left a tee turned to the right with the two openings plugged; from here on the "inside men" take hold of the situation.

SERVICES I909

Number Laid	2,070	Cost Laid per foot
Length Laid	II3,999 ft.	
Pipe Cost	$4014.49	$0.0352
Material Cost cock box fittings	3663.60	0.032I
Sundries Cost	I749.I7	0.0I53
Labor Cost	III42.25	0.0977
Pavement Cost	754.80	0.0066
Total cost per service	2I324.3I	0.I870
Average cost per service		$I0.30I6
Average length per service		55.07 feet

Before passing to the more detailed work of the "inside men" let me give a little space to our Stable and Storeroom divisions. Upon these two do the remaining divisions depend on for material and cartage. Where a great quanity of work is done in a given unit of time, say one (I) day, it is essential to secure prompt and efficient means of cartage to enable us to get this I am having an average amount of pipe and fittings delivered for each class of work, regardless of the actual amount

necessary to do the work. (See Prints Nos 5 & 6.

The fitter makes his connections and the material left over is picked up and returned to the Storeroom. This in conjunction with deliveries of service and cast iron pipe, stoves and water-heaters requires the use of three teams daily during the main laying season. For teams handling other than cast iron pipe, stops to the number of forty (40) can easily be made daily. By doing this maount of work it is possible to obtain a figure of ten #(.I0) cents per stop.

This brings me to the discussion of our shop and shop methods. The inside work is guided by the shop foreman who in turn is aided by a Despatcher, Office Boy and two inspectors. The physical work is divided into six classes, meter repairing, meter setting, complaint work, house-piping, applaince connections, and vent-pipe attachment.

All meters used are tested and sealed by a State Inspector and must pass a test showing less than 2% slow or fast. A meter repairer tries these meters on the prover before passing to the Inspector

and if found O. K. are given to him, if not they are opened up and examined. This examination may show a dirty or oily valve causing the meter to run slow, or it may show dried diaphrams causing the meter to run fast. Examination may find the necessity of adjusting, grinding of valves, oiling leathers, draining of leathers or leaky cases.

Our meter provers have a capacity of five (5) cubic feet, measure thirty-two (32) inches high and twenty-four (24) inches in diameter. A general idea can be obtained from the accompanying sketch #7.

This prover is standardized against a standard cubic foot kept at Albany, N. Y., which in turn is standardized with the Bureau of Standards Washington, D. C.

To determine the error of a meter take the difference between the readings of the meter and prover, multiply by one hundred (100) and divide by the reading of the prover. If the meter has a higher reading than the prover the error shows the meter fast, and vice versa.

These points of error are all common and

are taken care of in the repair shop, never on consumers premises. The accompanying sketch shows a standard tin gas meter in use to-day.

Our meter setting is handled by wagon work, covering scattered orders and without the use of the wagon when several orders exist in one block or locality. For wagon work the fitter is supplied with twelve (I2) meters strapped six (6) to each side shelf on the wagon. For fittings he has twelve (I2) sets of the following:-

I" St. Ells   I" Plugs   I" x 3/4" Ells
3/4" Cocks   3/4" Close Nipples   3/4" Ells
3/4"x I/2" Ells   I/2" Nuts & Swivels
Shelves
40 feet I" Pipe   20 feet 3/4" Pipe

Besides a few 3/4" assorted nipples. The shelves are placed under each meter and each meter is set with universal swing joints, as shown on the accompanying sketch. Meters are usually set with the bottom three(3) feet from the cellar floor.

When the meter is set the fitter turns on the gas and opens a burner at the highest point in the system connected, allowing the gas to displace

what ever air was in the system. The entire setting can be readily made in one hour and such time is expected of the men.

For complaint work such as adjusting burners, turning off and on gas supply, attention to leaks, two (2) men are kept busy. These men cover by bicycle or motorcycle daily about twenty (20) miles and, complete on an average of forty orders per ten hour day. This gives a cost of about five (5) cents or fifteen (I5) minutes per completed order. The complaint men carry as tools, two I0" trimo wrenches, one pair of I0" pliers, one 8" screw driver, one can of jointing mixture, orifices for burners, screws,nuts, and stove bolts. With this they ought to be able to handle any complaint and make at least temporary repairs to leaks. By having the complaint men telephone to the Despatcher alternate hours we are able to give very satisfactory service to the public.

Turning to the house piping division of the shop practice we find that the foreman resorts to the skill of one inspector in handling as many as ten (I0) fitters.

These fitters have no helpers and are expected to complete four (4) outlets per ten (I0) hour day, all piping concealed.

As with all gas pipe extension the Cox computer is used to determine the proper diameter of the pipe. This computer is based on Pole's formula:-

Discharge in cubic feet $= c\sqrt{\frac{d^5 \; (p_2 - p_1)}{l \times w}}$ where $c =$ II50 is a constant obtained from friction and other constants.

d = diameter of pipe in inches.

p_1 = initial pressure

p_2 = final pressure

I = length of pipe in yards

w = specific gravity of gas used (air= I)

For the convenience of the fitters the following table of sizes and lengths to be used is given:-

Size Of Pipe

Outlet	3/8"	I/2"	3/4"	I"	I¼"	I½"	2"	2½"
I	20	30	50	70	I00	I50	200	300
2		27	50	70	I00	I50	200	300
3		I2	50	70	I00	I50	200	300

Size Of Pipe

Outlet	3/8"	I/2"	3/4"	I"	I¼"	I½"	2"	2½"
4			50	70	I00	I50	200	300
5			33	70	I00	I50	200	300
6			24	70	I00	I50	200	300
8			I3	50	I00	I50	200	300
I0				35	I00	I50	200	300
I3				2I	60	I50	200	300
I5				I6	45	I20	200	300
20					27	65	200	300
25					I7	42	I75	300
30					I2	30	I20	300
35					I	22	90	270
40					I	I7	70	2I0
45						I3	55	I65
50							45	I35
65							27	80
75						2	20	60
I00								33
I25								22
I50								I5

A typical plan of house (extra large) is herein shown. Such a plan is submitted by the fitter for each job.

A few of the standard rules given the fitter are as follows:-

I- No house riser shall be less than 3/4" and shall have a tee at the base.

2- No house pipe shall be less than 3/8"

3- Gas is never supplied from a smaller pipe to a larger one.

4- All risers must be extended to within four (4) feet of where the meter is to set and to the right of same.

House Piping Rules (continued)

5- Avoid running lines along exposed walls.

6- Fittings should be used in preference to bended pipes.

7- House lines should be run along tops of beams not along the bottom.

All piping must stand the test of ten (I0) inches of mercury or its equivalent in pounds per square inch.

Fixtures should be of the following proportions:-

Kind	Length over all	Size of iron pipe cased
I- Single swing brackets	I2"	I/4"
2- Pendants	2' - 9"	I/4"
3- Two light	2' - 6"	I/4"
4- Three light	2' - 6"	I/4"

By economic operation the average outlet installed should cost as follows:-

Labor	$ 0.57
Inspection	0.I0
Material	0.42
Cartage	0.04
Total	$ I.I3

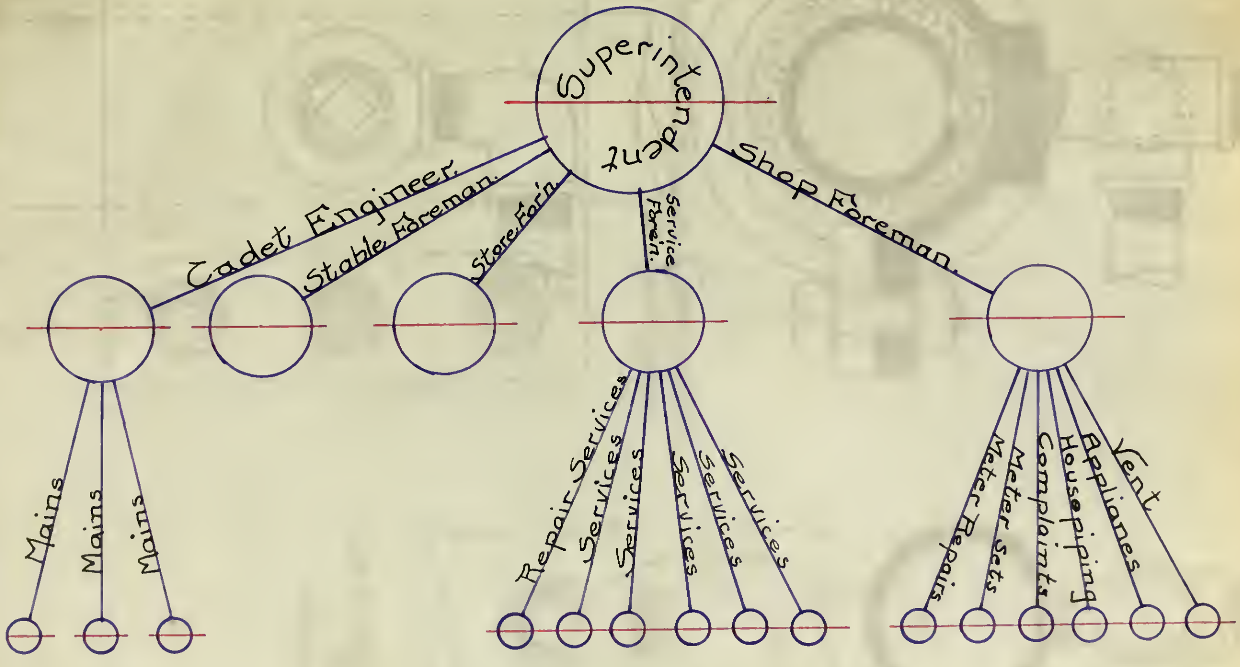
Like the house piping inspector is the appliance inspector, for he too has ten (I0) fitters without helpers installing at the rate of three (3) ranges per ten (I0) hour day.

In the majority of cases the lines from the meter to the kitchen are not run thus the above rate per day. This inspector also oversees meter setting, water heater (both circulating and instantaneous), and industrial appliance installations. On all water heaters (both kinds) we insist on making vent pipe connection, so as to insure proper means of drawing off spent and injurious gases.

In conclusion I may add that too much stress cannot be laid on the proper organization of any department whether gas distribution, contracting or any other complicated class of work wherein many are serving a common result, efficiency.

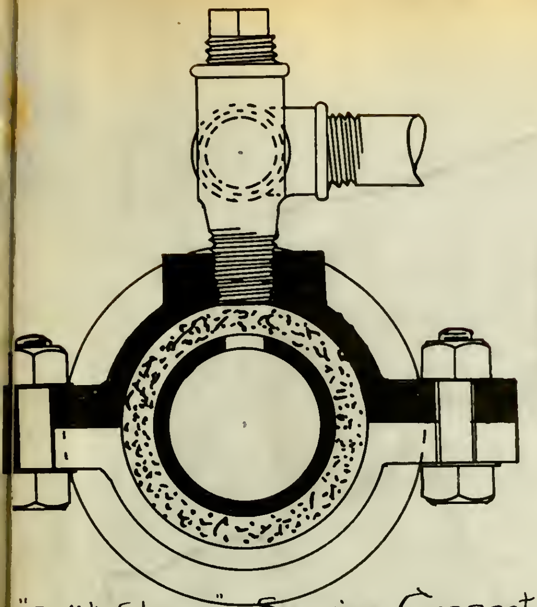
Respectfully Submitted

Sidney Chas. Singer.

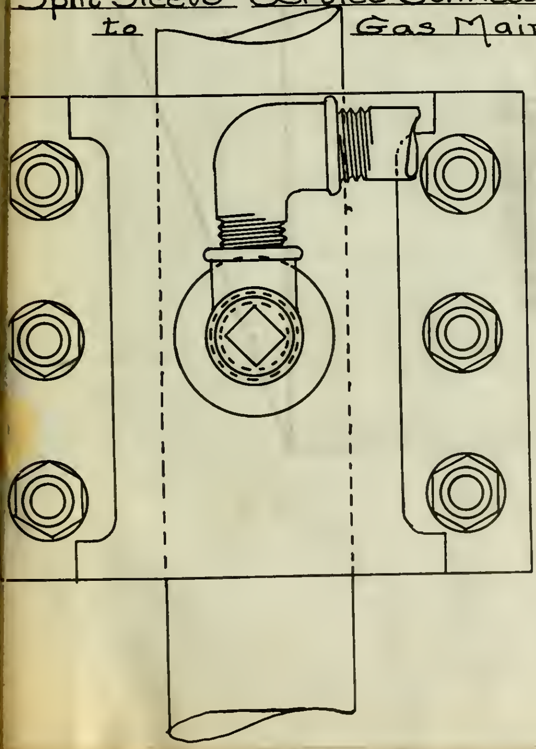


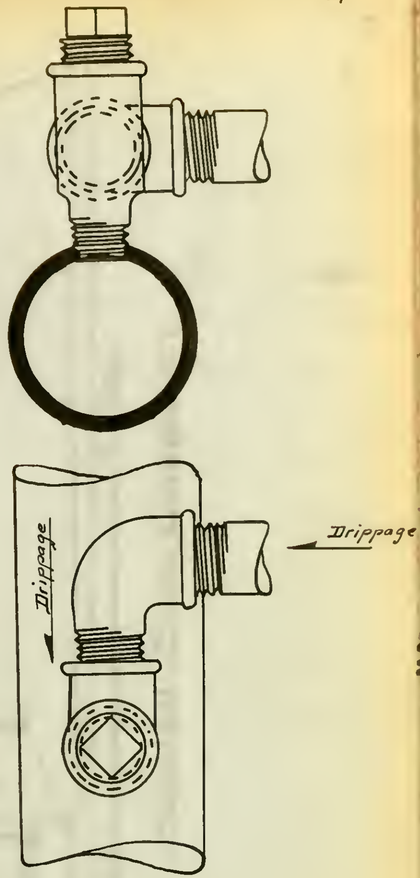
"Distribution Organization" Syracuse Lighting Co

S.C.S. 1910

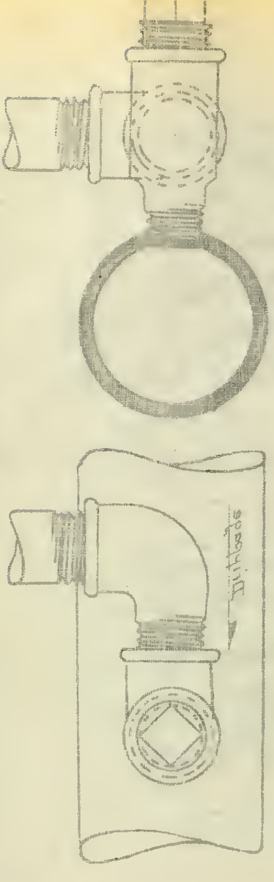


"Split Sleeve" Service Connection to Gas Main.





Service Connection to Gas Main.



Service Conne
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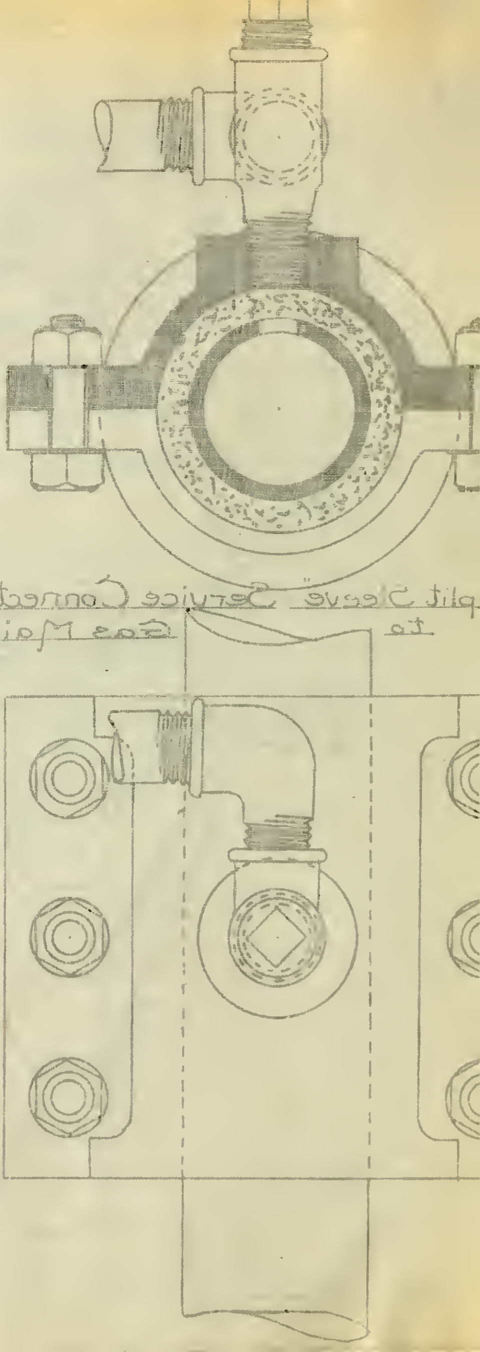

plit Sleeve" Service Connection.
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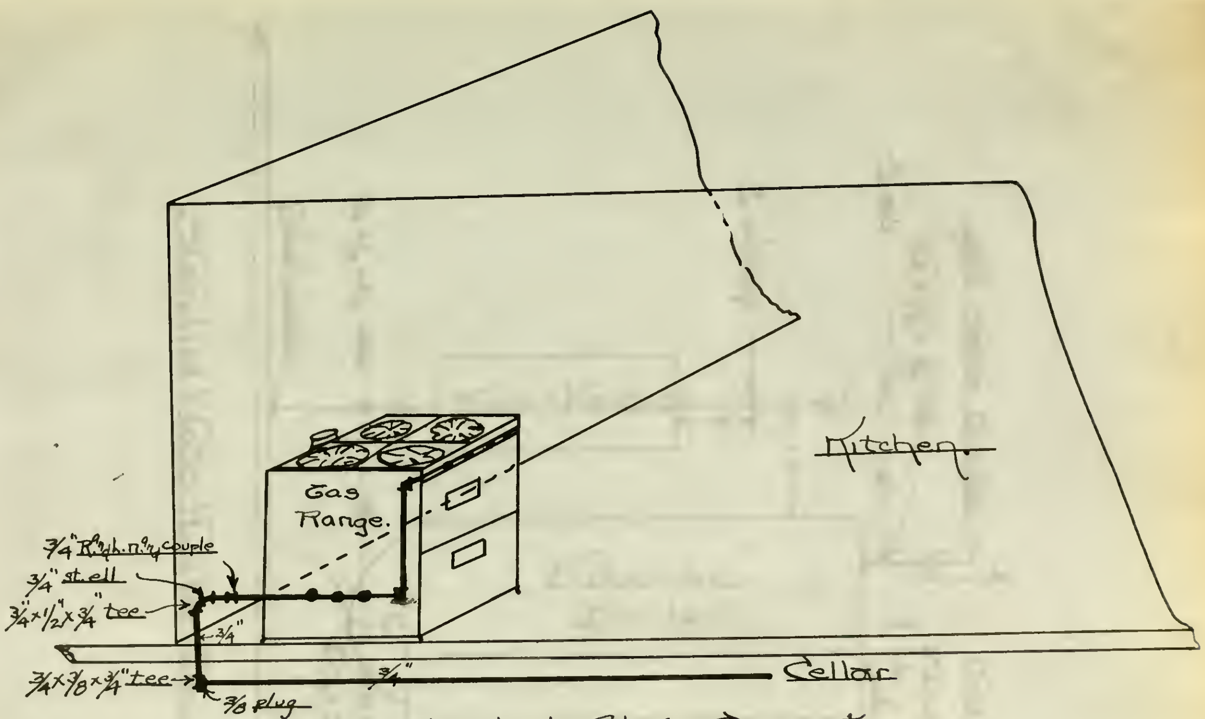
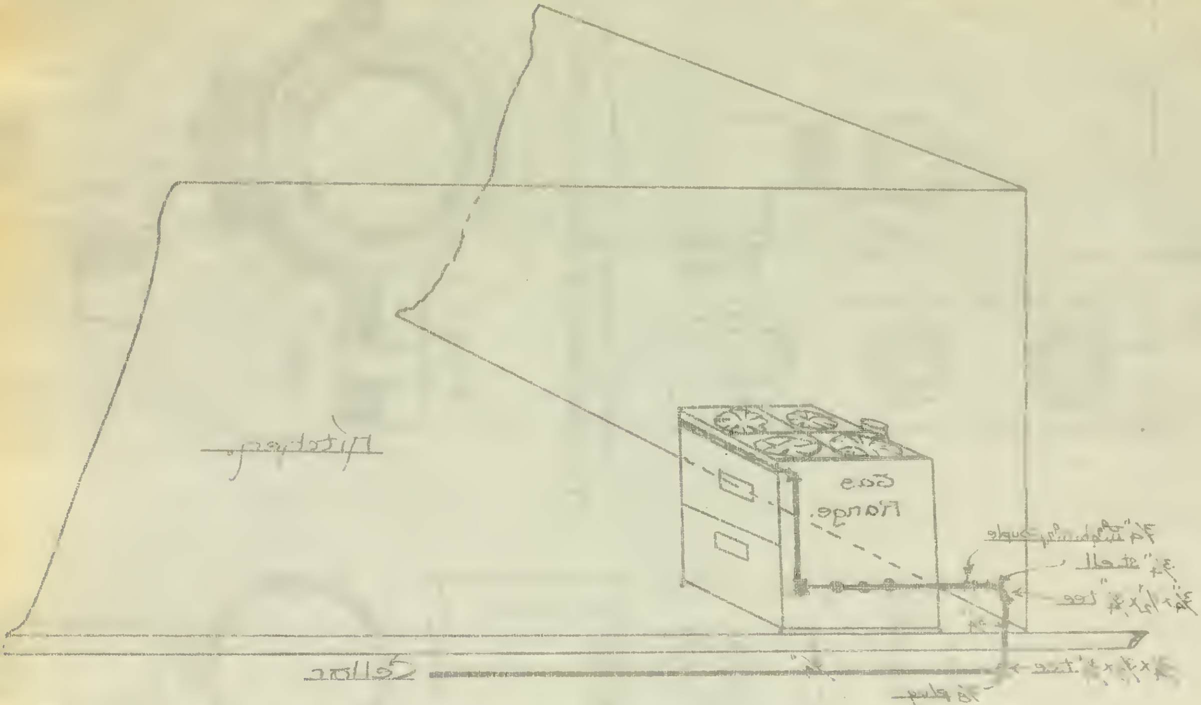
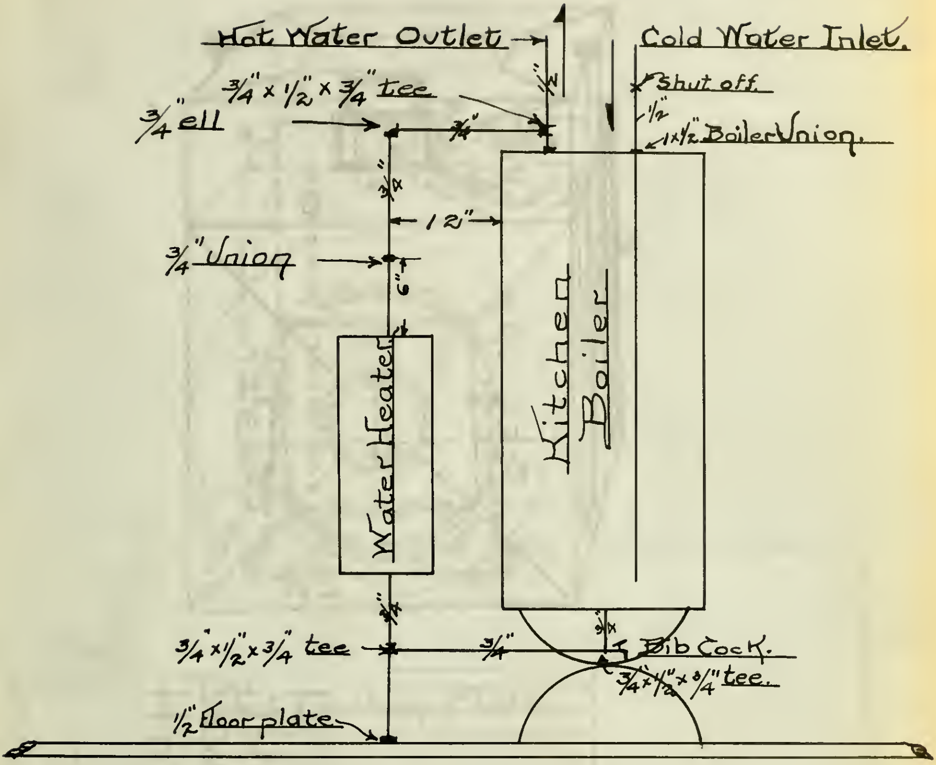


Standard Stove Connection.

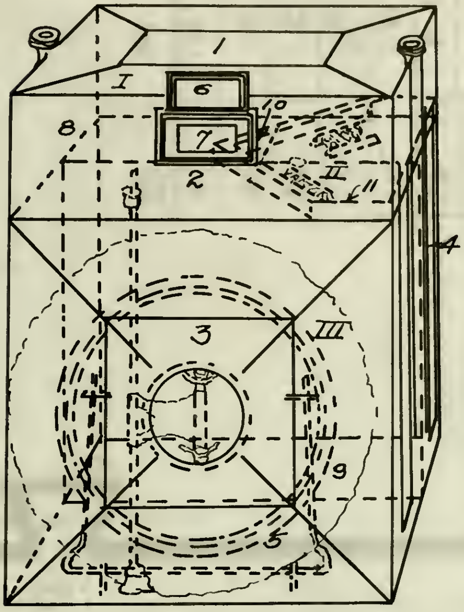


Standard Stove Connection.



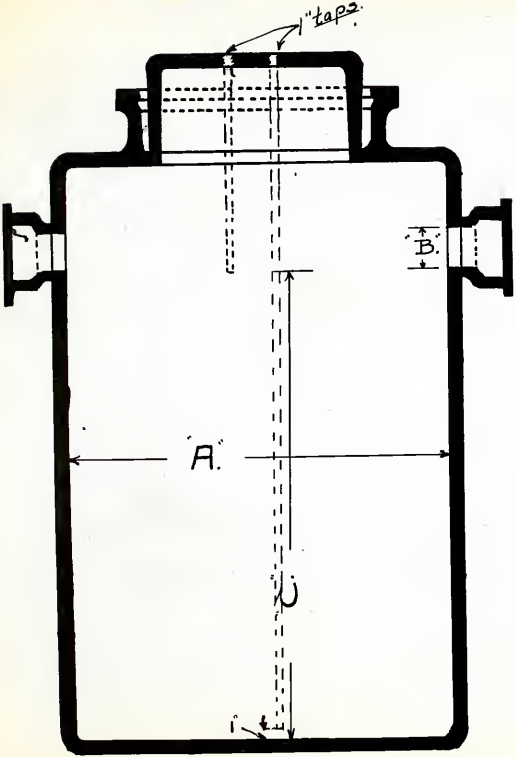
Standard Water Heater Connections.

Tin Plain Gas Meter.



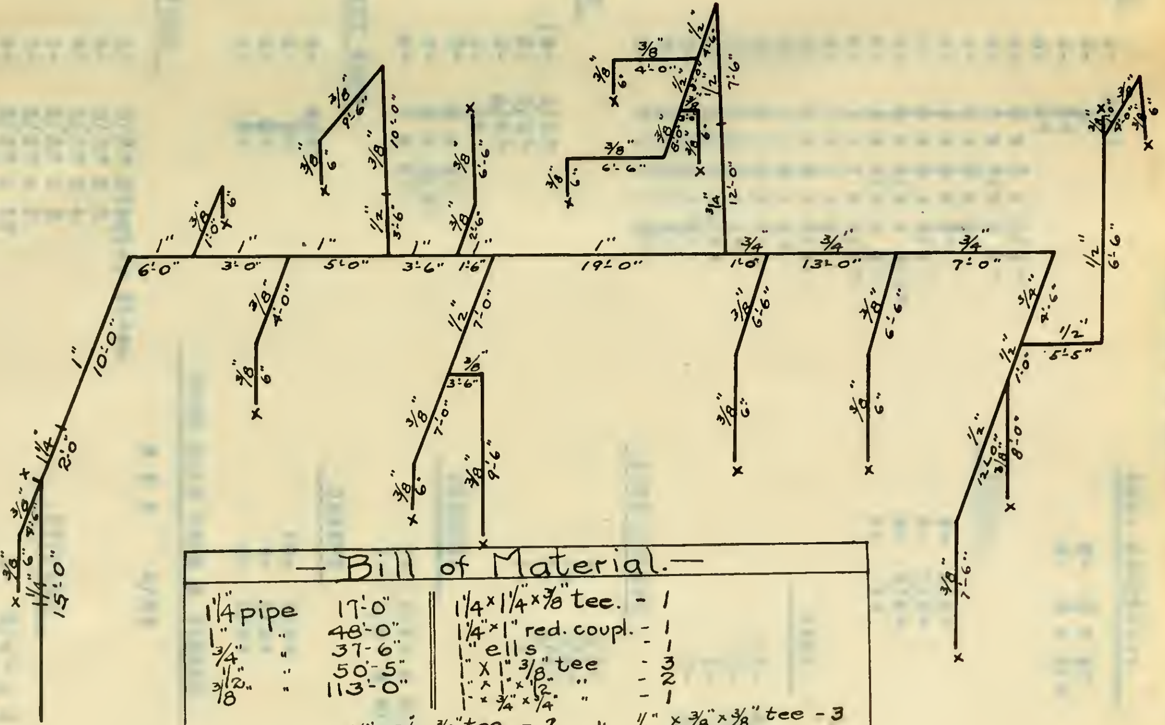
1.	Top.
2.	Front Gallery Plate.
3.	Front.
4.	Side.
5.	Bottom.
6.	Index Box Cover.
7.	Index Box.
8.	Company's Badge.
9.	Partition.
10.	Three Cornered Plate
11.	Back Plate.
I	Gallery
II.	Valve Chamber
III.	Diaphram Chamber.

Drip Pot for Gas Mains.



B.	A.	C.	Capacity in quarts.
4"	12"	24"	38
6"	12"	36"	57
8"	12"	30"	41
10"	16"	36"	52
12"	16"	36"	78
16"	20"	42"	135
20"	24"	42"	162
24"	30"	54"	348

Standard House-Piping Plan.



— Bill of Material. —

1¼" pipe	17'-0"
1" "	48'-0"
¾" "	37'-6"
½" "	50'-5"
⅜" "	113'-0"

1¼ x 1¼ x ⅜" tee. - 1
1¼" x 1" red. coupl. - 1
1" ells - 1
1" x 1" ⅜" tee - 3
1" x 1" x ½" " - 2
1" x ¾" x ¾" " - 1

¾" x ¾ x ⅜" tee - 2
¾" x ½" x ½" tee - 1
¾" x ½" red. coupl. - 1
¾" ell. - 1
½" x ½" x ⅜" tee - 2

½" x ⅜" x ⅜" tee - 3
½" ell - 2
½" x ⅜" red coupl. 1
⅜" ells 16
⅜" x 6" nipples - 17

⅜" caps - 17.

HOUSE PIPING

BASED ON I2
OUTLETS

TEES

4- 3/8"
3- ½"
2- ¾"
2- I"
3- ¾ x ¾ x 3/8"
3- ¾ x 3/8 x ¾"
2- ¾ x ¾ x ½"
2- ¾ x ½ x ¾"
2- ¾ x ½ x 3/8"
4- ½ x 3/8 x 3/8"
4- ½ x 3/8 x ½"
4- I x I x 3/8"
2- I x I x ½"
2- I x ¾ x 3/8"
2- I x ¾ x ½"
2- ¾ x ¾ x I"
2- I x ¾ x I"
2- ½ x ½ x3/8"
2- ¾ x ½ x ¾"
2- ½ x ½ x ¾"
2- I x I x ¾"

ELLS

I8- 3/8"
5- I/2"
3- 3/4"
2- I"
2- ¾ x ½"
2- ½ x 3/8"
2- I x ¾"

STREET ELLS

3- 2/8"
2- ½"
2- ¾"
2- I"

NIPPLES

3- 3/8" Nipples Close
4- 3/8" x 2
4- 3/8" x 4
3- 3/8" x 6
6- 3/8" x 8
4- 3/8" x I2
2- I/2" x 2
I- I/2" x 4
I- I/2" x 6
I- I/2" x 8

RED. COUPLINGS

2- ¾ x ½"
2- ½ x 3/8

PLUGS

4- 3/8"
2- I/2"
2- 3/4"
I- I"

CAPS

I4- 3/8"
2- I/2"
I- I"
2- 3/4"

LONG SCREWS

2- 3/8"
I- I/2"
I- 3/4"
I- I"

CROSSES

I- 3/4" x 3/8"
I- I/2" x 3/8"

CLASPS

I2- 3/8"
6- I/2"
4- 3/4"

DROP ELLS MALE & FEMALE

3 & 3 3/8"

NIPPLES

3- 3/4" x 2
2- 3/4" x 4
2- 3/4" x 6

HOUSE PIPING MATERIAL (CONTINUED)

PIPE	5 ROOMS	6 ROOMS	7 ROOMS	8 ROOMS	9 ROOMS	IO ROOMS	II ROOMS	I2 ROOMS
3/8"	3 LTH	3 LTH	4 LTH	4 LTH	4 LTH	4 LTH	4 LTH	4 LTH
I/2"	I "	2 "	2 "	2 "	2 "	2 "	2 "	2 "
3/4"	I "	I "	2 "	2 "	2 "	2 "	2 "	2 "
I"	I "	I "	I "	I½ "	I½"	I½ "	I½ "	2 "

STOVE FITTINGS

2- 3/4" Tees
I- I x ¾ x ¾" "
I- I x I x ¾" "
3- ¾ x ¾ x ½" "
I- ¾ x ½ x ¾" "

4- 3/4" Clasps

2- 3/4" R & L Nipples & Cup

8- 3/4" Ells

2- 3/4" 45° Ells

I- 3/4" Cross

3- 3/4" Plugs

2- I" "

2- I/2" "

2- I x 3/4" Red Coup

I- 3/4" x I/2" Red Coup

3- 3/4" Close Nipples

2- 3/4" x 2 Nipples

2- 3/4" x 3 "

2- 3/4" x 4 "

2- 3/4" x 5 Nipples (I each 6 to I2

2- I" Close Nipples

2- I" x 2 "

I- I" x 3 "

I- I" Coupling

2- I/2" Close Nipples

2- I/2" x 2 "

I- I/2" x 3 "

I- I/2" x 6 "

I- I/2" Coupling

5- 3/4" Pipe Hooks

I- 3/4" x I/2" Bushing

5- 3/4" Couplings

3- Lengths of 3/4" Pipe

FITTINGS FOR WATER HEATERS

I- 3/4 x I/2 x 3/4" Tee

I- 3/4 x 3/4 x I/2" "

I- I/2 x 3/8 Red Coupling

I- I/2" Long Screw

I- 3/4" " "

2- I/2" Plugs

I- I/2" Tee

6- I/2" Clasps

4- I/2" Ells

2- I/2" Street Ells

2- 3/8" Ells

I- 3/8" Street Ell

4- I/2" Nipples

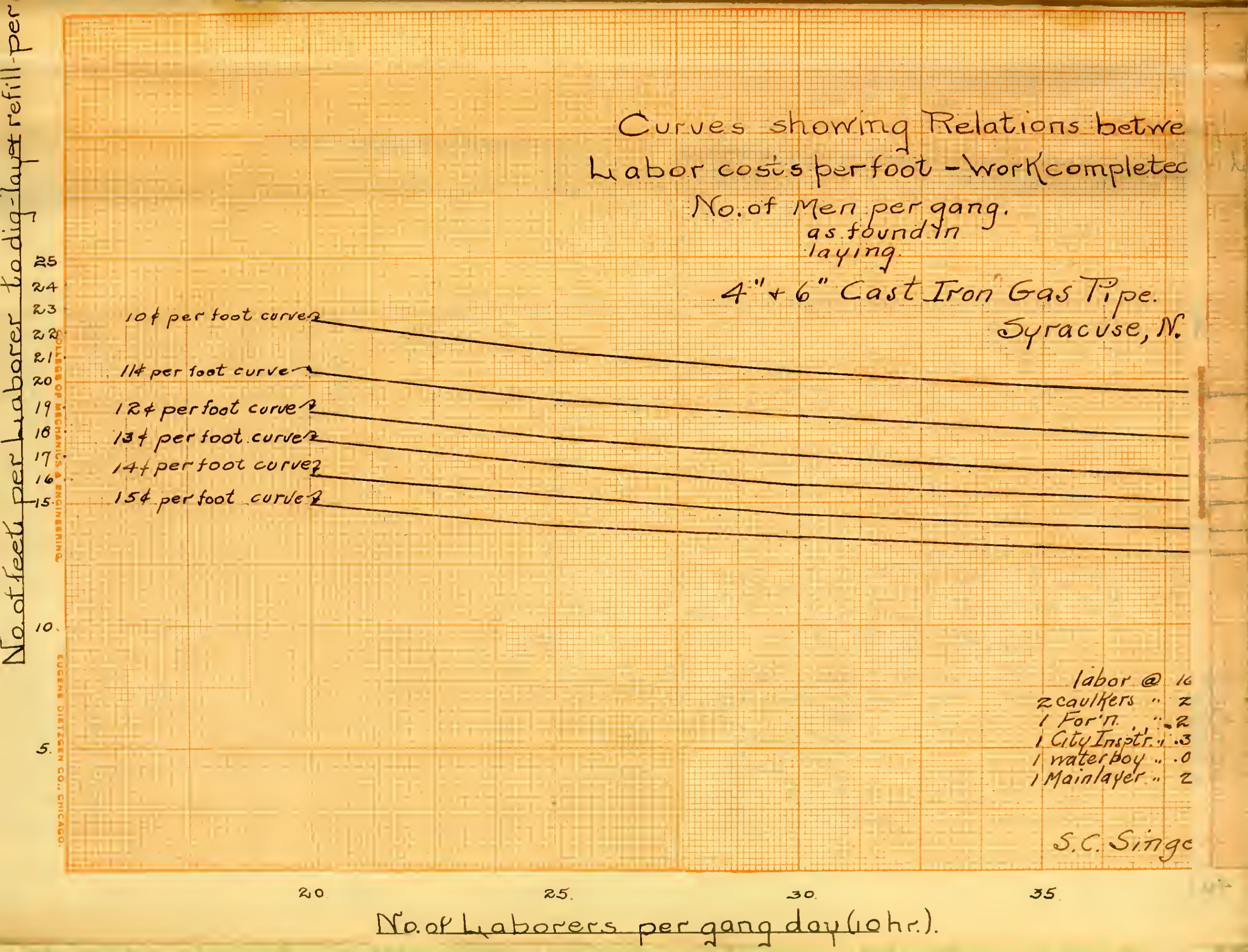
2- 3/4" "

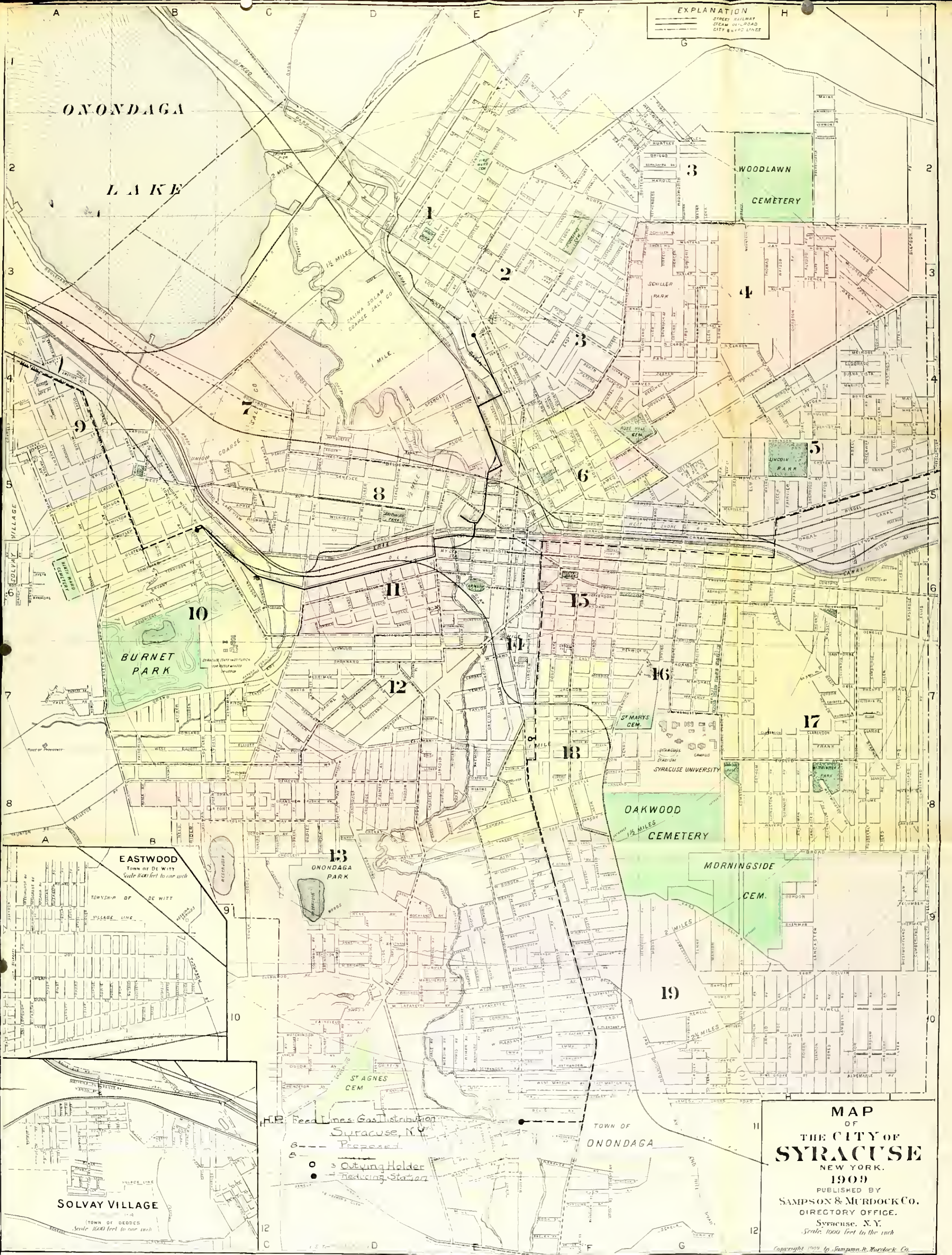
2- 3/8 "

I- Length of I/2" Pipe

COST OF PAVING PER FOOT

SIZE OF MAIN	WITH OF TRENCH	COST PER SQ. YARD I.00	I.25	I.50	2.00	2.25	2.50	2.75	3.00	3.25	3.50
4"	I8"	.I7	.2I	.25	.33	.38	.42	.46	.50	.54	.58
6"	I8"	.I7	.2I	.25	.33	.28	.42	.46	.50	.54	.58
8"	I8"	.I7	.2I	.25	.33	.38	.42	.46	.50	.54	.58
I0"	24"	.22	.28	.38	.44	.50	.56	.6I	.67	.72	.78
I2"	24"	.22	.28	.38	.44	.50	.56	.6I	.67	.72	.78
I6"	33"	.3I	.38	.46	.6I	.69	.76	.84	.92	.99	I.07
20"	33"	.3I	.38	.46	.6I	.69	.76	.84	.92	.99	I.07
24"	36"	.33	.42	.50	.67	.75	.83	.92	I.00	I.08	I.I7
30"	40"	.37	.46	.56	.74	.83	.93	I.02	I.II	I.20	I.30
36"	44"	.4I	.5I	.6I	.8I	.92	I.02	I.I2	I.22	I.32	I.43


Curves showing Relations betwe
Labor costs per foot - Work completec
No. of Men per gang.
as found in
laying.
4" + 6" Cast Iron Gas Pipe.
Syracuse, N.
10¢ per foot curve
11¢ per foot curve
12¢ per foot curve
13¢ per foot curve
14¢ per foot curve
15¢ per foot curve
labor @ 16
2 caulkers " 2
1 For'n. " .2
1 City Inspt'r " .3
1 waterboy " .0
1 Mainlayer " 2
S. C. Singe
No. of feet per Laborer to dig-lay + refill-per
25
24
23
22
21
20
19
18
17
16
15
10
5
20
25
30
35
No. of Laborers per gang day (10 hr.).
COLLEGE OF MECHANICS & ENGINEERING
EUGENE DIETZGEN CO., CHICAGO.



MAP
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THE CITY OF
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NEW YORK.
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